

Experimental concepts.

Theory. A theory can be defined as a "general principle proposed to explain how a number of separate facts are related." In other words, a theory is an "idea about a relationship."

Variables in our theory so that they are testable, and every experiment has two types of variables:

- o Independent Variable (IV) - the variable that is manipulated by the experimenter (input variable)
- o Dependent Variable (DV) - the outcome variable (results of the experiment)

Extraneous variables (Ex Vs): Other variables, apart from the IV, that might affect the DV. They might be important enough to provide alternative explanations for the effects, for example, confounding variables.

By defining our variables that we will use to test our theory we derive at our Hypothesis, which is a testable form of a theory.

Caffeine has an effect on alertness
(IV) (DV)

Research Biases

Now we've got a hypothesis which is the first step in doing an experiment. Before we can continue, however, we need to be aware of some aspects of research that can contaminate our results.

.Selection Bias - occurs when differences between groups are present at the beginning of the experiment.

· Placebo Effect - involves the influencing of performance due to the subject's belief about the results. In other words, if I believe the new medication will help me feel better, I may feel better even if the new medication is only a sugar pill. This demonstrates the power of the mind to change a person's perceptions of reality.

· Experimenter Bias - The same way a person's belief's can influence his or her perception, so can the belief of the experimenter. If I'm doing an experiment, and really believe my treatment works, or I really want the treatment to work because it will mean big bucks for me, I might behave in a manner that

Controlling for Biases

Most experiments use what's called Random Assignment, which means assigning the subjects to each group based on chance rather than human decision. To control for the placebo effect, subjects are often not informed of the purpose of the experiment.

This is called a Blind study, because the subjects are blind to the expected results. To control for experimenter biases, we can utilize a Double-Blind study, which means that both the experimenter and the subjects are blind to the purpose and anticipated results of the study.

Standardization

Standardization refers to a specific set of instructions. The reason we want the experiment to be standardized is twofold.

First, we want to make sure all subjects are given the same instructions, presented with the experiment in the same manner, and that all of the data is collected exactly the same for all subjects. Second, single experiments cannot typically stand on their own. To really show that our results are valid, experiments need to be replicated by other experimenters with different subjects. To do this, the experimenters need to know exactly what we did so they can replicate it.

Sampling Techniques

It is important to choose the correct sample from your population, this can minimise your extraneous variables.

Random sampling: Everyone in the entire target population has an equal chance of being selected.

Opportunity sampling: Uses people from target population available at the time.

Systematic sampling: Chooses subjects in a systematic way. For example, every 10th person from a list or register.

Self-selected sample: Participants volunteer. For example, by answering an advert.

Stratified sampling: Divides target population into groups, people in sample from each group in same proportions as population. So you would have a higher number of people between the ages of 20-30 than 70-80.

Types of Research

Perhaps the simplest form of research is Naturalistic Observation.

Observing behaviour in their natural environment

Often involves counting behaviours, such as number of aggressive acts, number of smiles, etc.

Advantages: Behaviour is naturally occurring and is not manipulated by a researcher and it can provide more qualitative data as opposed to merely quantitative information.

Limitations: Even the presence of someone observing can cause those being observed to alter their behaviour. Researcher's beliefs can also alter their observations. And, it is very difficult to coordinate multiple observers since observed behaviours must be operationally defined (e.g. what constitutes an aggressive act)

Laboratory experiments

Strengths

Tighter control of variables. Easier to comment on cause and effect.

Relatively easy to **replicate**.

Enable use of **complex equipment**.

Often **cheaper** and **less time-consuming** than other methods.

Weaknesses

Demand characteristics - participants aware of experiment, may change behaviour.

Artificial environment - low realism.

May have **low ecological validity** - difficult to generalise to other situations.

Experimenter effects - bias when experimenter's expectations affect behaviour.

Field experiments

A field experiment takes place anywhere in a natural setting; it could take place in a school, hospital, the street or an office.

Note:

A field **experiment** is an **experiment**; the independent variable is manipulated. Not all **field studies** are **experiments**.

Strengths

People may behave more naturally than in laboratory - **higher realism**.

Easier to **generalise** from results.

Weaknesses

Often only **weak control of extraneous variables** - difficult to replicate.

Can be **time-consuming and costly**.

Natural experiments

Strengths

Situations in which it would be **ethically unacceptable** to manipulate the independent variable.

Less chance of demand characteristics or experimenter bias interfering.

Weaknesses

The **independent variable is not controlled** by the experimenter.

No control over the allocation of participants to groups (random in a 'true experiment').

Case Study

Following a single case, typically over an extended period of time

Can involve naturalistic observations, and include psychological testing, interviews, interviews with others, and the application of a treatment or observation

Advantages: Can gather extensive information, both qualitative and quantitative and it can be helpful in better understanding rare cases or very specific interventions

Limitations: Only one case is involved, severely limiting the generalization to the rest of the population. Can be very time consuming and can involve other problems specific to the techniques used, including researcher bias.

Survey

Everyone has probably heard of this and many of you have been involved in research involving surveys. They are often used in the news, especially to gather viewer opinions such as during a race for president

Advantages: Can gather large amounts of information in a relatively short time, especially now with many surveys being conducted on the internet.

Limitations: Survey data is based solely on subjects' responses which can be inaccurate due to outright lying, misunderstanding of the question, placebo effect, and even the manner in which the question is asked

Correlational Studies

Correlation means relationship, so the purpose of a correlational study is to determine if a relationship exists, what direction the relationship is, and how strong it is.

Advantages: Can assess the strength of a relationship. Is popular with lay population because it is relatively easy to explain and understand.

Limitations: Can not make any assumptions of cause and effect (explain how third a variable can be involved, or how the variables can influence each other).

Interviews

Strengths

Detailed information can be **obtained** and **avoids oversimplifying** complex issues.

Greater attention to individual's point of view this is important in clinical psychology.

Unstructured, casual interviews may encourage **openness** in answers.

Weaknesses

Difficult to analyse if unstructured and qualitative in nature.

Time-consuming, expensive.

Possible interviewer effects. For example, people affected by attractiveness of interviewer!

Questionnaires

Strengths

Many people can be **tested quickly**. It is **easy to generate** quantitative data and **easy to analyse**.

Used to collect **large amounts of data** about what people **think** as well as what they **do!**

Convenient - researcher does not need to be present as answers can be mailed so respondent has time to consider answers.

Can **quickly show changes** in **attitudes** or **behaviour** before and after specific events.

Weaknesses

Social desirability - people say what they think looks good.

People may **not tell the truth**, especially on sensitive issues, for example, sexual behaviour.

If researcher is present then this may **affect answers**. Also, **postal surveys** may have **low response rate**.

Difficult to phrase questions clearly, you may obtain **different interpretations** of questions

Experimental design

Three experimental designs are commonly used:

Independent groups: Testing separate groups of people, each group is tested in a different condition.

Repeated measures: Testing the same group of people in different conditions, the same people are used repeatedly.

Matched pairs: Testing separate groups of people - each member of one group is same age, sex, or social background as a member of the other group.

In each case, there are one or more **experimental groups**, where the independent variable has changed and a **control group** where the independent variable has not changed.

Advantages and disadvantages for each experimental design

Independent groups:

(+) Avoids **order effects**. If a person is involved in several tests they may become bored, tired and fed up by the time they come to the second test, or becoming wise to the requirements of the experiment!

(-) More people are needed than with the repeated measures design.

(-) Differences between participants in the groups may affect results, for example; variations in age, sex or social background. These differences are known as **participant variables**.

Repeated measures:

(+) Avoids the problem of participant variables.

(-) Fewer people are needed.

(-) Order effects are more likely to occur.

Matched pairs:

(+) Reduces participant variables.

(+) Avoids order effects.

(-) Very time-consuming trying to find closely matched pairs.

(-) Impossible to match people exactly, unless identical twins!

Note:

Counterbalancing: Alternating the order in which participants perform in different conditions of an experiment. For example, group 1 does 'A' then 'B', group 2 does 'B' then 'A' this is to eliminate order effects.

Randomisation: Material for each condition in an experiment is presented in a random order, this is also to prevent order effects.

Central tendency and dispersion

Median: All values are arranged in order, the middle value is the median. Used with interval or ordinal level data, the median is not affected much by extreme values.

Mode: The most frequent value or score in a set of data. Used with nominal data. Does not give any information about other values.

Range: Simple measure of dispersion- shows the total spread of data. Difference between highest and lowest scores in a set of data: top value minus bottom value plus 1. Affected by atypical, extreme values.

Standard Deviation: Measure of dispersion- shows degree of clustering of values around the mean. Calculating standard deviation (S): Square root of sum of all squared deviations from the mean, divided by N (or sometimes N-1).
The most accurate measure of dispersion.

Reliability and Validity and other stuff!!!

Reliability of results is very important, so if a study is replicated the findings should be similar.

Validity, does a test measure what it was designed to measure. For example, do IQ tests really measure 'intelligence'?

Internal validity, extent to which study is free of design faults, which may affect results.

Ecological validity this is a type of 'external validity'. This means the extent to which generalisation can be made from the test environment to other situations

Demand characteristics: Participants might read things into the situation and start changing their behaviour they respond to the perceived demands of the study.